Applicability of Agile Scrum to BepiColombo MPO Science Ground Segment development

F. Pérez-López, S. Martínez, J. Gallegos, M. Casale, M. Cuevas, R. Gill, I. Ortiz de Landaluce, N. Fajersztejn, D. Galán, I. Serraller, M. Freschi,

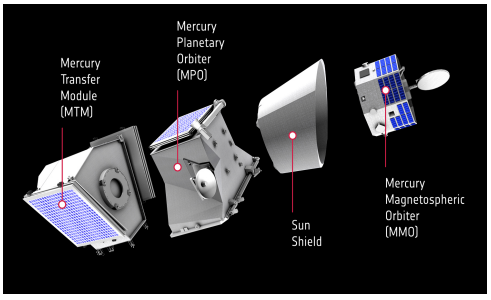
BepiColombo MPO Science Ground Segment (SGS), ESA/SCI-ODC, European Space Astronomy Center (ESAC), Madrid, Spain

Abstract

BepiColombo is an interdisciplinary ESA-JAXA mission to explore the planet Mercury. The Science Ground Segment (SGS), located at the European Space Astronomy Centre (ESAC), will be in charge of the ESA's Mercury Planetary Orbiter (MPO) scientific operations including data processing, preliminary analysis, archiving and distribution to the instrument teams and the science community. This paper describes the SGS development methodology and how it has been progressively migrated into an Agile Scrum, but maintaining the information consistency and the adherence to ECSS standards.

Introduction

BepiColombo is an ESA & JAXA mission to explore the planet Mercury. The mission consists of two separate Mercury orbiters: ESA's Mercury Planetary Orbiter (MPO) and JAXA's Mercury Magnetospheric Orbiter (MMO), which are dedicated to the detailed study of the planet and its magnetosphere.



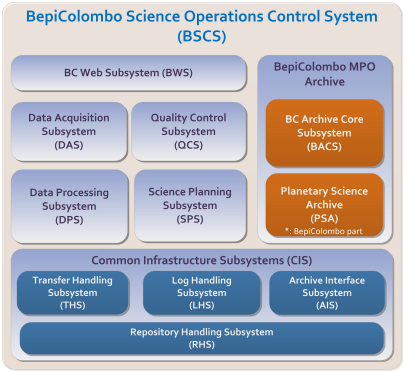
MPO is a three-axis-stabilized & nadir-pointing S/C with one Earth year of operational lifetime, operated and controlled from the Operations Ground Segment (OGS) located at the European Space Operations Centre (ESOC).

The MPO scientific payload comprises 11 instruments covering different scientific disciplines.

The SGS, located at ESAC, is responsible for the preparation of the MPO science operations, the data processing, the preliminary data analysis and the distribution of the operational and scientific data through the archive.

The SGS development was organized around the phased deployment of:

- The **Launch System** (LaS) to be operational by launch to support activities from launch through the first few years of the cruise phase.
- The **Mercury System** (MeS), to be deployed incrementally after launch to support the nominal science operations of the mission (2025-2026).



The SGS initially adopted an incremental development approach, the iterative **waterfall**, which means to deliver a working part of a total product or solution slicing the system functionality into increments.

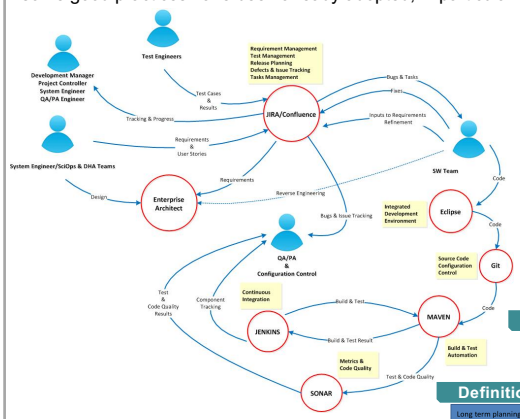
Development Methodology

However SGS could not apply this approach, and this was possibly for several reasons:

- User's involvement and system under-specification: At the SGS specification stage, it was difficult to anticipate the system needs 10 years in advance with the right level of detail for implementation. The involvement of final users in development & validation is not adequate to requirements ready to be implemented.
- Lateness Testing: The whole system is tested at the end which difficult the early bugs detection and the interaction with the final user.

Transitioning to Agile

It was decided to change progressively to Agile Scrum. This transition was easier because some good practices have been already adopted, in particular:

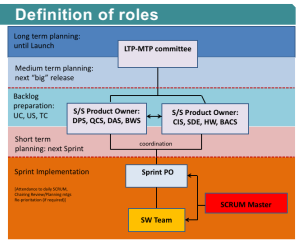


- JIRA/Confluence as configuration control
- Continuous integration environment: Git, Nexus, Maven, Jenkins, Sonar.
- Operational concepts and system architecture documentation consolidated.

Scrum Cycles

4-weeks

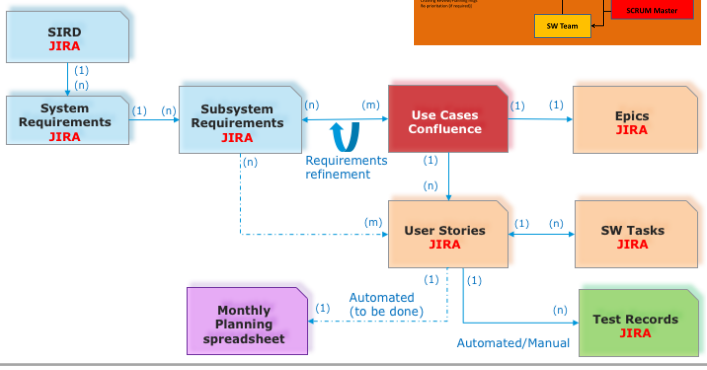
Definition of roles



Testing

- Automatic **regression** testing on daily deployment and sprint releases.
- Every six sprints a formal system testing campaign

Definition of epics/stories/tasks



Conclusions

- After some development sprint cycles applying this methodology we have noted a significant improvement of system, in terms of definition and performances. Now **the system does what should do** and the SGS is able to react in time to possible system changes.
- The involvement of the final users (i.e. instrument teams) has been improved by having a product available from early stages and incorporating users feedback into each monthly sprint.
- the communication between product owners and developers has been largely improved and now the requirements understanding have been improved.

Contact Info

Fernando Pérez López
Phone: +34 91 8131 203
Fernando.Perez-Lopez@esa.int
gmv for esa
European Space Astronomy Center (ESAC), P.O. Box 78, 28691, Villanueva de la Cañada, Madrid, Spain

Acknowledgements

The authors would like to thank to M. García-Reinaldos (ESA/SCI-OQ), J. Marcos (ESA/TEC-QQS) and M. Fernández (ESA/TEC-QQS) for their valuable consultancy support in all the related discussions. Thanks, specially, to the SGS SW team, for their effort, flexibility and all of their contributions and ideas.

References

1. Benkhoff J., et al., BepiColombo—Comprehensive exploration of Mercury: Mission overview and science goals Planetary and Space Science, Vol.58, Issues 1-2, January 2010
2. Barbarisi I., et al., "The Planetary Science Archive", 2015, AGU Fall (December 2015).
3. Gill R., et al., "BepiColombo Science Ground Segment Requirements Management and More with Native JIRA", ADASS XXIV (October 2014), vol. 495 of Astronomical Society of the Pacific Conference Series, 371.
4. Macfarlane A., et al., "The BepiColombo Archive Core System", ADASS XXIV (October 2014), vol. 495 of Astronomical Society of the Pacific Conference Series, 547.